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The claimed invention is:

1. A process for preparing a carbon black product having an organic group attached to the carbon black comprising the step of:

5 reacting at least one diazonium salt with a carbon black in the absence of an externally applied electric current sufficient to reduce the diazonium salt.

2. A process of claim 1 wherein the reacting step is carried out in an aprotic medium.

3. A process of claim 1 wherein the reacting step is carried out in a protic medium.

4. A process of claim 1 wherein the diazonium salt is generated in situ.

10 5. A process for preparing a carbon black product having an organic group attached to the carbon black comprising the step of:

reacting at least one diazonium salt with a carbon black in a protic reaction medium.

6. A process of claim 5 wherein the diazonium salt is generated in situ from a primary amine.

15 7. A process of claim 6 wherein the diazonium salt is generated in situ by reacting the primary amine, at least one nitrite and at least one acid.

8. A process of claim 7 wherein the nitrite is a metal nitrite, and the acid and amine are present in a one to one molar ratio.

9. A process of claim 6 wherein the diazonium salt is generated in situ by reacting the primary amine with a nitrite and the primary amine contains a strong acid group.

20 10. A process of claim 9 wherein the primary amine is para-aminobenzenesulfonic acid (sulfanilic acid).

11. A process of claim 6 wherein the diazonium salt is generated in situ by reacting the primary amine with an aqueous solution of nitrogen dioxide.

25 12. A process of claim 6 wherein the protic medium is an aqueous medium, and the primary amine is an amine of the formula A_yArNH_2 , in which:

Ar is an aromatic or heteroaromatic radical;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

30 a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, a carboxylate salt, halogen, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

35 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; wherein

5 k is an integer from 1 to 8;
X- is a halide or an anion derived from a mineral or organic acid;
y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and
Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z, or (CH₂)_xS(CH₂)_z, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

10 13. A process of claim 12 wherein:
Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

15 a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO^{NR₄}⁺, halogen, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃^{NR₄}⁺, NR(COR), CONR₂, NO₂, PO₃H₂, PO₃HN₂, PO₃Na₂, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and

20 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; wherein

25 k is an integer from 1 to 8;
X- is a halide or an anion derived from a mineral or organic acid; and
y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl.

14. A process of claim 12, wherein:

30 Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

35 a functional group selected from the group consisting of S_kR, SSO₃H, SO₂NRR', SO₂SR, SNRR', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), and 2-(1,3-dithiolanyl); and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl;

5 y is an integer from 1-5 when Ar is phenyl, 1-4 when Ar is benzothiazolyl, and 1-3 when Ar is benzothiadiazolyl;

10 k is an integer from 1 to 8; and

Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z, or (CH₂)_xS(CH₂)_z, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

15 15. A process of claim 12, wherein R and R' are selected from NH₂-C₆H₄, CH₂CH₂-C₆H₄-NH₂, CH₂-C₆H₄-NH₂, and C₆H₅.

16. A process of claim 12, wherein A is (CH₂)_qS_k(CH₂)_rAr, where k is an integer from 1 to 8, q is an integer from 0 to 4, r is an integer from 0-4, and Ar is a substituted or unsubstituted aryl or heteroaryl group.

17. A process of claim 6 wherein the primary amine is an aminobenzenesulfonic acid or a salt thereof, an aminobenzenecarboxylic acid or a salt thereof, or bis-para-H₂N-(C₆H₄)-S_k-(C₆H₄)-NH₂ wherein k is an integer from 2 to 8.

20 18. A process of claim 17 wherein the primary amine is para-aminobenzenesulfonic acid (sulfanilic acid).

19. A process of claim 17, wherein the primary amine is bis-para-H₂N-(C₆H₄)-S_k-(C₆H₄)-NH₂ and k is 2, (para-aminophenyldisulfide).

20. A process of claim 6 wherein the primary amine is H₂NArS_kAr', where k is an integer from 2 to 4, Ar is phenylene, and Ar' is benzothiazolyl.

25 21. A process of claim 6 wherein the primary amine is H₂NArS_kArNH₂, where k is an integer from 2 to 4 and Ar is benzothiazolylene.

22. A process of claim 21 wherein k is 2.

23. A process of claim 6 wherein the primary amine is H₂NArSH, where Ar is phenylene or benzothiazolylene.

24. A process of claim 5 wherein the diazonium salt is generated in situ.

25. A process of claim 5 wherein the diazonium salt is generated from a primary amine separately from the reacting step.

30 26. A process of claim 25 wherein the protic medium is an aqueous medium, and the primary amine is an amine of the formula A_yArNH₂, in which:

Ar is an aromatic or heteroaromatic radical;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

5 a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, a carboxylate salt, halogen, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

10 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; wherein

15 k is an integer from 1 to 8;

X- is a halide or an anion derived from a mineral or organic acid;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z, or (CH₂)_xS(CH₂)_z, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

20 27. A process of claim 25 wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

25 a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO⁺NR₄⁺, halogen, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃⁺NR₄⁺, NR(COR), CONR₂, NO₂, PO₃H₂, PO₃HNa, PO₃Na₂, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and

30 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; wherein

35 k is an integer from 1 to 8;

X- is a halide or an anion derived from a mineral or organic acid; and

y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl.

28. A process of claim 25, wherein:

5 Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

10 a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NRR' , SO_2SR , $SNRR'$, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, and $2-(1,3\text{-dithiolanyl})$; and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

15 where R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl;

y is an integer from 1-5 when Ar is phenyl, 1-4 when Ar is benzothiazolyl, and 1-3 when Ar is benzothiadiazolyl;

20 k is an integer from 1 to 8; and

Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

25 29. A process of claim 26, wherein R and R' are selected from $NH_2-C_6H_4$, $CH_2CH_2-C_6H_4-NH_2$, $CH_2-C_6H_4-NH_2$, and C_6H_5 .

30 30. A process of claim 26, wherein A is $(CH_2)_qS_k(CH_2)_rAr$, where k is an integer from 1 to 8, q is an integer from 0 to 4, r is an integer from 0-4, and Ar is a substituted or unsubstituted aryl or heteroaryl group.

35 31. A process of claim 25 wherein the primary amine is an aminobenzenesulfonic acid or a salt thereof, an aminobenzenecarboxylic acid or a salt thereof, or bis-para- $H_2N-(C_6H_4)-S_k-(C_6H_4)-NH_2$ wherein k is an integer from 2 to 8.

32. A process of claim 31 wherein the primary amine is para-aminobenzenesulfonic acid (sulfanilic acid).

33. A process of claim 31 wherein the primary amine is bis-para- $H_2N-(C_6H_4)-S_k-(C_6H_4)-NH_2$ and k is 2, (para-aminophenyldisulfide).

34. A process of claim 25 wherein the primary amine is H_2NArS_kAr' , where k is an integer from 2 to 4, Ar is phenylene, and Ar' is benzothiazolyl.

35. A process of claim 25 wherein the primary amine is $H_2NArS_kArNH_2$, where k is an integer from 2 to 4 and Ar is benzothiazolylene.

36. A process of claim 25 wherein the primary amine is H_2NArSH , where Ar is phenylene or benzothiazolylene.

5 37. A process of claim 5 wherein the protic reaction medium is an aqueous medium.

38. A process of claim 37 wherein the organic group of the diazonium salt is substituted or unsubstituted and is selected from the group consisting of an aliphatic group, a cyclic organic group, or an organic compound having an aliphatic portion and a cyclic portion.

10 39. A process of claim 5 wherein the protic reaction medium is water.

40. A process of claim 5 wherein the protic medium is an alcohol-based medium.

41. A carbon black product prepared according to the process of claim 1.

42. A carbon black product prepared according to the process of claim 5.

43. A carbon black product prepared according to the process of claim 12.

44. A carbon black product prepared according to the process of claim 13.

15 45. A carbon black product prepared according to the process of claim 14.

46. A carbon black product of claim 42 wherein the organic group is substituted or unsubstituted and is selected from the group consisting of an aliphatic group, a cyclic organic group, or an organic group having an aliphatic portion and a cyclic portion.

20 47. A carbon black product of claim 42 wherein the organic group is a substituted or unsubstituted aromatic group.

48. A carbon black product of claim 47 wherein an aromatic ring of the aromatic group is an aryl group.

49. A carbon black product of claim 47 wherein an aromatic ring of the aromatic group is a heteroaryl group.

25 50. A carbon black product of claim 47 wherein said aromatic group is a group of the formula A_yAr , wherein:

Ar is an aromatic or heteroaromatic radical;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

30 a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, a carboxylate salt, halogen, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

35

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene; wherein

5 k is an integer from 1 to 8;

X- is a halide or an anion derived from a mineral or organic acid;

10 y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z, or (CH₂)_xS(CH₂)_z, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

51. A carbon black product of claim 50, wherein said aromatic group is a group of the formula A_yAr, wherein:

15 Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

20 a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO^{NR4+}, halogen, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃NR₄⁺, NR(COR), CONR₂, NO₂, PO₃H₂, PO₃Na₂, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

25 where R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl or arylene; wherein

k is an integer from 1 to 8;

X- is a halide or an anion derived from a mineral or organic acid; and

30 y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl.

52. A carbon black product of claim 50, wherein said aromatic group is a group of the formula A_yAr, wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, benzothiazolyl, and benzothiadiazolyl;

35 A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NRR' , SO_2SR , $SNRR'$, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, and $2-(1,3\text{-dithiolanyl})$; and

5 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R' , which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene;

10 y is an integer from 1-5 when Ar is phenyl, 1-7 when Ar is naphthyl, 1-4 when Ar is benzothiazolyl, and 1-3 when Ar is benzothiadiazolyl;

k is an integer from 1 to 8; and

Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

15 53. A carbon black product of claim 42 wherein said aromatic group is phenyl or naphthyl.

54. A carbon black product of claim 47 wherein said aromatic group is a group of the formula A_yAr , wherein:

20 Ar is an aromatic or heteroaromatic radical;

A , which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

25 a functional group selected from the group consisting of OR , COR , $COOR$, $OCOR$, a carboxylate salt, CN , NR_2 , SO_3H , a sulfonate salt, OSO_3H , OSO_3^- salts, $NR(COR)$, $CONR_2$, NO_2 , OPO_3H_2 , a monobasic or dibasic phosphate salt, PO_3H_2 , a monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, $2-(1,3\text{-dithiolanyl})$, SOR , and SO_2R ; and

30 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

35 where R and R' , which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene; wherein

k is an integer from 1 to 8;

35 X^- is a halide or an anion derived from a mineral or organic acid;

y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and

Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

55. A carbon black product of claim 54, wherein said aromatic group is a group of the formula A_yAr , wherein:

5 Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

10 a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, $COO^NR_4^+$, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃ $^NR_4^+$, NR(COR), CONR₂, NO₂, PO₃H₂, PO₃Na₂, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and

15 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl or arylene; wherein

20 k is an integer from 1 to 8;

X- is a halide or an anion derived from a mineral or organic acid; and

25 y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl.

56. A carbon black product of claim 54, wherein said aromatic group is a group of the formula A_yAr , wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

25 A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

a functional group selected from the group consisting of S_kR, SSO₃H, SO₂NRR', SO₂SR, SNRR', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), and 2-(1,3-dithiolanyl); and

30 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or 35 substituted arylalkyl, arylene, heteroarylene, or alkylarylene;

y is an integer from 1-5 when Ar is phenyl, 1-4 when Ar is benzothiazolyl, and 1-3 when Ar is benzothiadiazolyl;

k is an integer from 1 to 8; and

5 Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

10 57. A carbon black product comprising a carbon black and at least one attached organic group having a) an aromatic group and b) an acidic group having a pKa of less than 11, or a salt of an acidic group having a pKa of less than 11, or a mixture of an acidic group having a pKa of less than 11 and a salt of an acidic group having a pKa of less than 11, wherein at least one aromatic group of the organic group is directly attached to the carbon black.

58. A carbon black product of claim 57 wherein the acidic group is a sulfonic acid group, a sulfinic acid group, a carboxylic acid group, or a phosphonic acid group.

59. A carbon black product of claim 57 wherein the acidic group is SSO_3H , OPO_3H_2 , or OSO_3H .

15 60. A carbon black product of claim 57 wherein the aromatic group is a substituted phenyl group.

61. A carbon black product of claim 57 wherein the aromatic group is a substituted naphthyl group.

20 62. A carbon black product of claim 57 wherein the organic group is a substituted or unsubstituted sulfophenyl group or a salt thereof, or the organic group is a substituted or unsubstituted (polysulfo)phenyl group or a salt thereof.

63. A carbon black product of claim 57 wherein the organic group is a substituted or unsubstituted carboxyphenyl group or a salt thereof, or the organic group is a substituted or unsubstituted (polycarboxy)phenyl group or a salt thereof.

25 64. A carbon black product of claim 57 wherein the organic group is a substituted or unsubstituted sulfonaphthyl group or a salt thereof, or the organic group is a substituted or unsubstituted (polysulfo)naphthyl group or a salt thereof.

30 65. A carbon black product of claim 57 wherein the organic group is a substituted or unsubstituted carboxynaphthyl group or a salt thereof, or the organic group is a substituted or unsubstituted (polycarboxy)naphthyl group or a salt thereof.

66. A carbon black product of claim 57 wherein the organic group is p-sulfophenyl or a salt thereof.

67. A carbon black product of claim 57 wherein the organic group is p-carboxyphenyl or a salt thereof.

35 68. A carbon black product of claim 57 wherein the organic group is the Na salt of p-sulfophenyl.

69. A carbon black product of claim 57 wherein the organic group is a hydroxysulfophenyl group.

70. A carbon black product of claim 69 wherein the organic group is 4-hydroxy-3-sulfophenyl.

5 71. A carbon black product comprising a carbon black and at least one organic group having a) an aromatic group and b) a cationic group, wherein at least one aromatic group of the organic group is attached to the carbon black.

72. A carbon black product of claim 71 wherein the cationic group is a quaternary ammonium group or a quaternary phosphonium group.

10 73. A carbon black product of claim 71 wherein the aromatic group is a substituted phenyl group.

74. A carbon black product of claim 71 wherein the aromatic group is a substituted naphthyl group.

15 75. A carbon black product of claim 71 wherein the organic group is $X^{\cdot}R_3N^+(CH_2)_yAr$, wherein Ar is phenylene or naphthylene; R is independently hydrogen or a C₁-C₂₀ alkyl group; X[·] is a halide or an anion derived from a mineral or organic acid; and y is an integer from 0 to 4.

76. A carbon black product of claim 75, wherein y is 0.

20 77. A carbon black product of claim 71, wherein the organic group is $X^{\cdot}R_3N^+CH_2COAr$, wherein R is a substituted or unsubstituted C₁-C₁₀ alkyl, Ar is phenylene or naphthylene; and X[·] is a halide or an anion derived from a mineral or organic acid.

78. A carbon black product of claim 71 wherein the organic group is a N-substituted pyridinium group.

25 79. A carbon black product of claim 78, wherein the organic group is $-C_5H_4N-R^+X^{\cdot}$, where R is a substituted or unsubstituted C₁-C₂₀ hydrocarbon, and X[·] is a halide or an anion derived from a mineral or organic acid.

80. A carbon black product comprising a carbon black and at least one attached organic group having a) a C₁-C₁₂ alkyl group and b) an acidic group having a pKa of less than 11, or a salt of an acidic group having a pKa of less than 11, or a mixture of an acidic group having a pKa of less than 11 and a salt of an acidic group having a pKa of less than 11, wherein the C₁-C₁₂ alkyl group of the organic group is directly attached to the carbon black.

81. A carbon black product of claim 80 wherein the organic group is C₂H₄SO₃H.

35 82. A carbon black product comprising a carbon black and at least one organic group Ar(CH₂)_qS_k(CH₂)_rAr' attached to the carbon black, wherein Ar and Ar' may be the same or different and are chosen from the group consisting of arylene and heteroarylene; k is an integer from 1 to 8; q is an integer from 0 to 4; and r is an integer from 0 to 4.

83. A carbon black product of claim 82 wherein Ar and Ar' are an arylene; k is an integer from 1 to 8; and q and r are 0.

84. A carbon black product of claim 82 wherein Ar and Ar' are phenylene; k is an integer from 2 to 4; and q and r are 0.

5 85. A carbon black product of claim 84 wherein k is 2.

86. A carbon black product of claim 82 wherein Ar and Ar' are a heteroarylene; k is an integer from 1 to 8; and q and r are 0.

87. A carbon black product of claim 82 wherein Ar and Ar' are benzothiazolylene; k is an integer from 2 to 4; and q and r are 0.

10 88. A carbon black product of claim 87 wherein k is 2.

89. A carbon black product comprising a carbon black and at least one organic group $\text{Ar}(\text{CH}_2)_q\text{S}_k(\text{CH}_2)_r\text{Ar}'$ attached to the carbon black, wherein Ar is an arylene or a heteroarylene; Ar' is an aryl or a heteroaryl; k is an integer from 1 to 8; q is an integer from 0 to 4; and r is an integer from 0 to 4.

15 90. A carbon black product of claim 89 wherein Ar is an arylene; Ar' is an aryl; k is an integer from 1 to 8; and q and r are 0.

91. A carbon black product of claim 89 wherein Ar is phenylene; Ar' is phenyl; k is an integer from 2 to 4; and q and r are 0.

92. A carbon black product of claim 89 wherein Ar is phenylene; Ar' is a heteroaryl; k is an integer from 1 to 8; and q and r are 0.

20 93. A carbon black product of claim 89 wherein Ar is phenylene; Ar' is benzothiazolyl; k is an integer from 2 to 4; and q and r are 0.

94. A carbon black product comprising a carbon black and at least one organic group ArSH attached to the carbon black, wherein Ar is an arylene or a heteroarylene.

25 95. A carbon black product of claim 94 wherein Ar is phenylene.

96. A carbon black product of claim 94 wherein Ar is benzothiazolylene.

97. A carbon black product of claim 71, wherein the organic group is $\text{Ar}-\text{Ar}'^+\text{X}^-$, wherein Ar is substituted or unsubstituted phenylene, substituted or unsubstituted naphthylene; Ar' is substituted or unsubstituted pyridinium; and X^- is a halide or an anion derived from a mineral or organic acid.

30 98. A carbon black product of claim 97, wherein the organic group is $-\text{C}_6\text{H}_4(\text{NC}_3\text{H}_5)^+\text{X}^-$.

99. A process for producing a carbon black product having an organic group attached to the carbon black, comprising the steps of

35 introducing a carbon black and at least one diazonium salt into a pelletizer; and reacting said diazonium salt with said carbon black.

100. The process of claim 99, wherein the diazonium salt is reacted with the carbon black in the presence of water.

101. The process of claim 99, wherein the diazonium salt is introduced as an aqueous solution or slurry.

5 102. The process of claim 99, wherein the carbon black product is pelletized.

103. The process of claim 101, wherein the carbon black product is pelletized.

104. A process for producing a carbon black product having an organic group attached to the carbon black, comprising the steps of

generating a diazonium salt in the presence of carbon black in a pelletizer; and

10 105. The process of claim 104, wherein the diazonium salt is generated in the presence of water.

106. The process of claim 104, wherein the diazonium salt is generated from at least one primary amine, at least one acid, and at least one nitrite.

15 107. The process of claim 105, wherein the diazonium salt is generated from at least one primary amine, at least one acid, and at least one nitrite.

108. The process of claim 107, wherein the nitrite is introduced into the pelletizer as an aqueous solution.

20 109. The process of claim 107, wherein the amine is introduced into the pelletizer as an aqueous solution or slurry of an acid salt of the amine.

110. The process of claim 107, wherein the nitrite is introduced into the pelletizer as an aqueous solution and the amine is introduced into the pelletizer as an aqueous solution or slurry of an acid salt of the amine.

25 111. The process of claim 107, wherein the amine and the carbon black are introduced into the pelletizer as a dry mixture.

112. A plastic composition comprising a plastic and a carbon black product prepared according to the process of claim 1.

113. A plastic composition comprising a plastic and a carbon black product prepared according to the process of claim 5.

30 114. A paper product comprising paper pulp and a carbon black product having at least one organic group attached to the carbon black wherein the organic group is substituted with an ionic or an ionizable group.

115. A paper product of claim 114 wherein the ionic or ionizable group is a sulfonic acid group or a salt thereof, a sulfinic acid group or a salt thereof, a carboxylic acid group or a salt thereof, a phosphonic acid group or a salt thereof, or a quaternary ammonium group.

116. A paper product of claim 114 wherein the organic group is a substituted or unsubstituted sulfophenyl group or a salt thereof, or the organic group is a substituted or unsubstituted (polysulfo)phenyl group or a salt thereof.

5 117. A paper product of claim 114 wherein the organic group is a substituted or unsubstituted sulfonaphthyl group or a salt thereof, or the organic group is a substituted or unsubstituted (polysulfo)naphthyl group or a salt thereof.

118. A paper product of claim 114 wherein the organic group is p-sulfophenyl or a salt thereof.

10 119. A rubber composition prepared by the process comprising mixing rubber and a carbon black product comprising a carbon black and at least one organic group $Ar(CH_2)_qS_k(CH_2)_rAr'$ attached to the carbon black, wherein Ar and Ar', which may be the same or different, are substituted or unsubstituted arylene or heteroarylene groups; k is an integer from 1 to 8; q is an integer from 0 to 4; and r is an integer from 0 to 4.

15 120. A rubber composition of claim 119 wherein Ar and Ar' are an arylene; k is an integer from 1 to 8; and q and r are 0.

121. A rubber composition of claim 119 wherein Ar and Ar' are phenylene; k is an integer from 2 to 4; and q and r are 0.

122. A rubber composition of claim 121 wherein k is 2.

20 123. A rubber composition of claim 119 wherein Ar and Ar' are a heteroarylene; k is an integer from 1 to 8; and q and r are 0.

124. A rubber composition of claim 119 wherein Ar and Ar' are benzothiazolylene; k is an integer from 2 to 4; and q and r are 0.

125. A rubber composition of claim 124 wherein k is 2.

25 126. A rubber composition prepared by the process comprising mixing rubber and a carbon black product comprising carbon black and at least one organic group $Ar(CH_2)_qS_k(CH_2)_rAr'$ attached to the carbon black, wherein Ar is an arylene or a heteroarylene; Ar' is an aryl or a heteroaryl; k is an integer from 1 to 8; q is an integer from 0 to 4; and r is an integer from 0 to 4.

127. A rubber composition of claim 126 wherein Ar is an arylene; Ar' is an aryl; k is an integer from 1 to 8; and q and r are 0.

30 128. A rubber composition of claim 126 wherein Ar is phenylene; Ar' is phenyl; k is an integer from 2 to 4; and q and r are 0.

129. A rubber composition of claim 126 wherein Ar is phenylene; Ar' is a heteroaryl; k is an integer from 1 to 8; and q and r are 0.

35 130. A rubber composition of claim 126 wherein Ar is phenylene; Ar' is benzothiazolyl; k is an integer from 2 to 4; and q and r are 0.

131. A rubber composition prepared by the process comprising mixing rubber and a carbon black product comprising a carbon black and at least one organic group ArSH attached to the carbon black, wherein Ar is an arylene or a heteroarylene.

132. A rubber composition of claim 131 wherein Ar is phenylene.

5 133. A rubber composition of claim 131 wherein Ar is benzothiazolylene.

134. A rubber composition of claim 119 which is cured.

135. A rubber composition of claim 126 which is cured.

136. A rubber composition of claim 131 which is cured.

137. A rubber composition of claim 122 which is cured.

10 138. A fiber or textile composition comprising a fiber or textile and a carbon black product having at least one organic group attached to the carbon black wherein the organic group is substituted with an ionic or an ionizable group.

139. A fiber or textile composition of claim 138 wherein the ionic or ionizable group is a sulfonic acid group or a salt thereof, a sulfonic acid group or a salt thereof, a carboxylic acid group or a salt thereof, a phosphonic acid group or a salt thereof, or a quaternary ammonium group.

15 140. A fiber or textile composition of claim 138 wherein the organic group is a substituted or unsubstituted sulfophenyl group or a salt thereof, or the organic group is substituted or unsubstituted (polysulfo)phenyl group or a salt thereof.

141. A fiber or textile composition of claim 138 wherein the organic group is a substituted or unsubstituted sulfonaphthyl group or a salt thereof, or the organic group is substituted or unsubstituted (polysulfo)naphthyl group or a salt thereof.

20 142. A fiber or textile composition of claim 138 wherein the organic group is p-sulfophenyl or a salt thereof.

143. A carbon black product comprising a carbon black and at least one organic group attached to the carbon black, wherein the organic group is an aromatic group of the formula A_yAr , wherein:

25 Ar is an aromatic or heteroaromatic radical;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

30 a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl),

35 2-(1,3-dithiolanyl), SOR, and SO₂R; and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene; wherein

5 k is an integer from 1 to 8;

X' is a halide or an anion derived from a mineral or organic acid;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

10 Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z, or (CH₂)_xS(CH₂)_z, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

144. A carbon black product of claim 143, wherein said aromatic group is a group of the formula A_yAr, wherein:

15 Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONA, COOK, COONR₄⁺, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃NR₄⁺, NR(COR),

20 CONR₂, NO₂, PO₃H₂, PO₃HNa, PO₃Na₂, N=NR, N₂⁺X', NR₃⁺X', PR₃⁺X', SkR, SOR, and SO₂R; and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl;

25 unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl or arylene; wherein

k is an integer from 1 to 8;

X' is a halide or an anion derived from a mineral or organic acid; and

y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl.

30 145. A carbon black product of claim 143, wherein said aromatic group is a group of the formula A_yAr, wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

A, which can be the same or different when y is greater than 1, is independently a substituent 35 on the aromatic radical selected from:

a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NRR' , SO_2SR , $SNRR'$, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, and $2-(1,3\text{-dithiolanyl})$; and

5 a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

where R and R' , which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene;

10 y is an integer from 1-5 when Ar is phenyl, 1-4 when Ar is benzothiazolyl, and 1-3 when Ar is benzothiadiazolyl;

k is an integer from 1 to 8; and

Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

15 146. A rubber composition prepared by the process comprising mixing rubber and a carbon black product having at least one organic group attached to the carbon black, wherein the organic group is A_yAr , wherein:

Ar is an aromatic or heteroaromatic radical;

20 A , which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

a functional group selected from the group consisting of OR , COR , $COOR$, $OCOR$, a carboxylate salt, halogen, CN , NR_2 , SO_3H , a sulfonate salt, OSO_3H , OSO_3^- salts, $NR(COR)$, $CONR_2$, NO_2 , OPO_3H_2 , a monobasic or dibasic phosphate salt, PO_3H_2 , a monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, $2-(1,3\text{-dithiolanyl})$, SOR , and SO_2R ; and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

30 where R and R' , which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene; wherein

k is an integer from 1 to 8;

X^- is a halide or an anion derived from a mineral or organic acid;

35 y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and

Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

147. A rubber composition of claim 146, wherein said aromatic group is a group of the formula A_yAr , wherein:

5 Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

10 a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NRR' , SO_2SR , $SNRR'$, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-piperazinediyl)-SR$, $2-(1,3-dithianyl)$, and $2-(1,3-dithiolanyl)$; and

a linear, branched or cyclic hydrocarbon radical, unsubstituted or substituted with one or more of said functional groups;

15 where R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; unsubstituted or substituted arylalkyl, arylene, heteroarylene, or alkylarylene;

y is an integer from 1-5 when Ar is phenyl, 1-4 when Ar is benzothiazolyl, and 1-3 when Ar is benzothiadiazolyl;

20 k is an integer from 1 to 8; and

Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$, or $(CH_2)_xS(CH_2)_z$, where x is 1 to 6, z is 1 to 6, and w is 2 to 6.

148. A rubber composition of claim 146 which is cured.

149. A rubber composition of claim 147 which is cured.

25 150. A carbon black product comprising a carbon black and at least one organic group $ArNH_2$ attached to the carbon black, wherein Ar is a substituted or unsubstituted arylene.

151. A carbon black product of claim 150, wherein Ar is phenylene.

30 152. A carbon black product comprising a carbon black and at least one organic group $ArQAr'NH_2$, wherein Ar and Ar', which may be the same or different, are substituted or unsubstituted arylene, and Q is CH_2 or SO_2 .

153. A carbon black product of claim 152, wherein Ar and Ar' are phenylene.

35 154. A carbon black product having an organic group attached to the carbon black, obtainable by a process comprising the step of reacting at least one diazonium salt with a carbon black in a protic reaction medium, wherein said diazonium salt is generated *in situ* from a primary amine, the protic medium is an aqueous medium, and the primary amine is an amine of the formula A_yArNH_2 , in which:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- 5 - a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;
- 10 - a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- 15 - a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

25 and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

155. The carbon black product of claim 154, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- 30 - a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

5

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

10

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

15

156. The carbon product of claim 154, wherein
Ar is an aromatic or heteroaromatic radical;
y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and
A, which can be the same or different when y is greater than 1, is independently a substituent
20 on the aromatic radical selected from:

25

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

30

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

157. The carbon black product of claim 154, wherein

Ar is an aromatic or heteroaromatic radical;

5 y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and
A, which can be the same or different when y is greater than 1, is a functional group selected
from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl,
branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl,
unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl,
10 unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

158. A carbon black product, having an aromatic group attached to the carbon black,
obtainable by a process comprising the step of reacting at least one diazonium salt with a carbon
black in a protic reaction medium, wherein said aromatic group is a group of the formula A_yAr, in
which:

15 Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and
A, which can be the same or different when y is greater than 1, is independently a substituent
on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched
20 C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl,
unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl,
unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and
unsubstituted or substituted arylalkyl;
- a functional group selected from the group consisting of OR, COR, COOR, OCOR,
25 a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts,
NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a
monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR,
SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-
30 piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or
more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀
unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted
or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted
35 arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid;

and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

159. The carbon black product of claim 158, wherein

5 Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;
- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

160. The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

30 y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a

5 monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-piperazinediyl)-SR$, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR , and SO_2R ; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

10 wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

15 and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

161. The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

20 y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is a functional group selected from the group consisting of a branched or unbranched C_1-C_{20} substituted alkyl, branched or unbranched C_3-C_{20} unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

25 162. The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

30

- a functional group selected from the group consisting of a branched or unbranched C_1-C_{20} substituted alkyl, branched or unbranched C_3-C_{20} unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;
- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR_2 , SO_3H , a sulfonate salt, OSO_3H , OSO_3^- salts, $NR(COR)$, $CONR_2$, NO_2 , OPO_3H_2 , a monobasic or dibasic phosphate salt, PO_3H_2 , a monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-$

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- piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

10 163. The carbon black product of claim 158, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

15 y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;
- a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO⁻NR₄⁺, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃⁻ NR₄⁺, NR(COR), CONR₂, NO₂, PO₃HN_a, PO₃Na₂, N=NR, N₂⁺X⁻, X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

20 25 wherein R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; and X⁻ is a halide or an anion derived from a mineral or organic acid.

30 35 164. The carbon black product of claim 158, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, benzothiazolyl, and benzothiadiazolyl;

y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 4 when Ar is benzothiazolyl, and 1 to 3 when Ar is benzothiadiazolyl; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

5 - a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NRR' , SO_2SR , $SNRR'$, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, $2-(1,3\text{-dithiolanyl})$; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

10 wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, 15 and w is 2 to 6.

165. The carbon black product of claim 158, wherein
Ar is an aromatic or heteroaromatic radical;
y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and
A, which can be the same or different when y is greater than 1, is independently a substituent

20 on the aromatic radical selected from:

25 - a functional group selected from the group consisting of OR , COR , $COOR$, $OCOR$, a carboxylate salt, CN , NR_2 , SO_3H , a sulfonate salt, OSO_3H , OSO_3^- salts, $NR(COR)$, $CONR_2$, NO_2 , OPO_3H_2 , a monobasic or dibasic phosphate salt, PO_3H_2 , a monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4\text{-piperazinediyl})-SR$, $2-(1,3\text{-dithianyl})$, $2-(1,3\text{-dithiolanyl})$, SOR , and SO_2R ; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

30 wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

166. The carbon black product of claim 165, wherein said aromatic group is a group of the formula A_yAr , in which:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

5 y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

10 - a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, $COO^+NR_4^+$, CN, NR_2 , SO_3H , SO_3Li , SO_3Na , SO_3K , $SO_3^-NR_4^+$, $NR(COR)$, $CONR_2$, NO_2 , PO_3HNa , PO_3Na_2 , $N=NR$, $N_2^+X^-$, X^- , $PR_3^+X^-$, S_kR , SOR, and SO_2R ; and

15 - a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

15 wherein R is hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; and X^- is a halide or an anion derived from a mineral or organic acid.

167. The carbon black product of claim 165, wherein said aromatic group is a group of the formula A_yAr , in which:

Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

20 y is an integer from 1 to 5 when Ar is phenyl, 1 to 4 when Ar is benzothiazolyl, and 1 to 3 when Ar is benzothiadiazolyl; and

25 A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

25 - a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NR' , SO_2SR , SNR' , SNQ , SO_2NQ , CO_2NQ , $S-(1,4-piperazinediyl)-SR$, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl); and

30 - a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

35 wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid;

and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

168. A carbon black product comprising a carbon black and at least one organic group attached to the carbon black, wherein the organic group is an aromatic group of the formula A_yAr , wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

10 - a functional group selected from the group consisting of a branched or unbranched C_1-C_{20} substituted alkyl, branched or unbranched C_3-C_{20} unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

15 - a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR_2 , SO_3H , a sulfonate salt, OSO_3H , OSO_3^- salts, $NR(COR)$, $CONR_2$, NO_2 , OPO_3H_2 , a monobasic or dibasic phosphate salt, PO_3H_2 , a monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-$

20 piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO_2R ; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

30 169. The carbon black product of claim 168, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of $-CH$ radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

35 - a functional group selected from the group consisting of a branched or unbranched

C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

5 - a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

10 - a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

170. The carbon black product of claim 168, wherein:

20 Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

25 - a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

30 - a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid;

and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

171. The carbon black product of claim 168, wherein:

5 Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, 10 unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

172. The carbon black product of claim 168, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent 15 on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a 20 monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

25 wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

30 173. The carbon black product of claim 168, wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl anthryl, phenanthryl, biphenyl, and pyridyl;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent 35

on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO⁻NR₄⁺, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃⁻ NR₄⁺, NR(COR), CONR₂, NO₂, PO₃H₂, PO₃HNa, PO₃Na₂, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid.

174. The carbon black product of claim 168, wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

15 y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of S_kR, SSO₃H, SO₂NR'R', SO₂SR, SNR'R', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl); and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein X is 1 to 6, z is 1 to 6, and w is 2 to 6.

175. A carbon black product comprising a carbon black and at least one organic group having a) an aromatic group and b) a cationic group, wherein at least one aromatic group of the organic group is attached to the carbon black and wherein the organic group is a N-substituted pyridinium group.

176. A carbon black product comprising a carbon black and at least one organic group ArOH attached to the carbon black, wherein Ar is arylene or heteroarylene.

177. A carbon black product comprising a carbon black and at least one organic group Ar(CH₂)_qS_k(CH₂)_rAr' attached to the carbon black, wherein Ar and Ar' are arylene, k is an integer

from 1 to 8, and q and r are 0.

178. A carbon black product comprising a carbon black and at least one organic group $\text{Ar}(\text{CH}_2)_q\text{S}_k(\text{CH}_2)_r\text{Ar}'$ attached to the carbon black, wherein Ar and Ar' are heteroarylene, k is an integer from 1 to 8, and q and r are 0.

5 179. A process for preparing a carbon black product having an organic group attached to the carbon black comprising the step of:

reacting at least one diazonium salt with a carbon black in a protic reaction medium, wherein the diazonium salt is generated in situ from the primary amine $\text{H}_2\text{NArS}_k\text{ArNH}_2$ wherein Ar is benzothiazolylene and k is 2.

10 180. A plastic composition comprising a plastic and the carbon product according to claim 154.

181. A paper product comprising paper pulp and the carbon product according to claim 154.

15 182. A fiber or textile composition comprising a fiber or textile and the carbon black product according to claim 154.

183. An elastomer composition obtainable by mixing at least one elastomer and the carbon black product according to claim 154.

20 184. The elastomer composition of claim 183, wherein the elastomer comprises at least one synthetic or natural polymer of 1,3-butadiene, styrene, isoprene, isobutylene, 2,3-dimethyl-1,3-butadiene, acrylonitrile, ethylene, or propylene.

185. The elastomer composition of claim 184, further comprising at least one additive selected from the group consisting of: a curing agent, a coupling agent, a processing aid, an oil extender, and an antioxidant.

25 186. A cured elastomer composition obtainable by curing the elastomer composition of claim 183.

187. A rubber composition obtainable by mixing a rubber and the carbon black product according to claim 154.

188. The rubber composition of claim 187, wherein the rubber comprises a natural rubber, a synthetic rubber, or mixtures of a natural and synthetic rubber.

30 189. The rubber composition of claim 188, wherein the rubber is selected from the group consisting of: copolymers of from about 10 to about 70 percent by weight of styrene and from about 90 to about 30 percent by weight of butadiene, polymers of conjugated dienes, and copolymers of conjugated dienes with ethylenic group-containing monomers.

35 190. The rubber composition of claim 189, wherein the rubber is a rubber selected from the group consisting of: polybutadiene, polyisoprene, polychloroprene, and poly(styrene-butadiene).

191. The rubber composition of claim 190, further comprising at least one additive selected from the group consisting of: a curing agent, a coupling agent, a processing aid, an oil extender, and an antioxidant.

192. A cured rubber composition obtainable by curing the rubber composition of claim 5 187.

193. A tire or tire component comprising the elastomer composition of claims 183.

194. A tire or tire component comprising the rubber composition of claims 187.

195. A method of decreasing the tan delta max at 70 deg C of an elastomer composition comprising the step of combining an elastomer with at least one carbon black product of claims 154.

10 196. The method of claim 195, further comprising forming the elastomer composition into a tire or tire component.

197. A method of increasing the abrasion resistance of an elastomer composition comprising the step of combining an elastomer with at least one carbon black product of claim 154.

15 198. The method of claim 197, further comprising forming the elastomer composition into a tire or tire component.